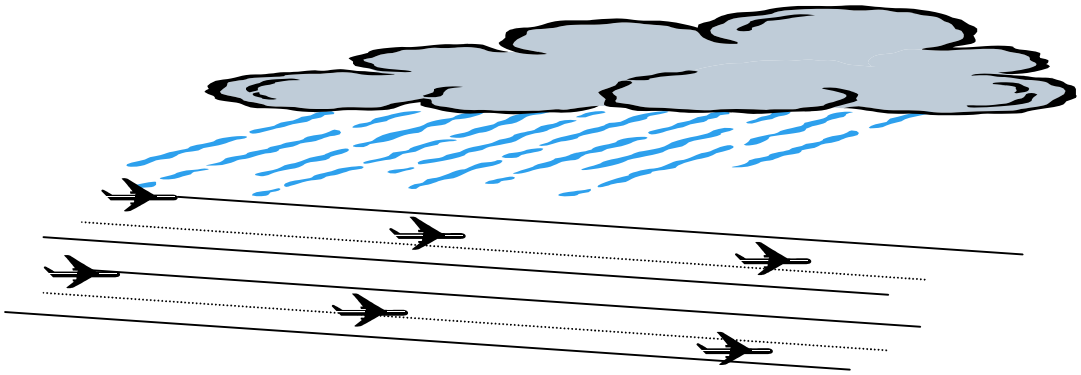
AW-1: Maintain Runway Use in Reduced Visibility

Optimize acceptance rates as weather deteriorates from Visual Meteorological Conditions (VMC) to Instrument Meteorological Conditions (IMC)



Background

There are two or more runway acceptance rates for each airport (based on benchmark analysis) – an optimum rate based on good weather conditions and reduced rates based on adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation. Two underlying factors that affect airport operations in periods of reduced visibility are:

1. Lack of instrument approach procedure(s) available at the airport; and
2. Inability to maximize runway acceptance when visual separation can no longer be applied.

The goal is to achieve near optimum runway acceptance rates without regard for meteorological conditions. At airports without an existing instrument procedure, the publication of Area Navigation (RNAV)-based instrument approaches provides a new capability within the NAS. For those airports with existing procedures but non-optimum runway acceptance rates, other tools/operational implementations are required.

Ops Change Description

Arrival rates deteriorate as weather changes from visual to instrument conditions. This premise is founded on the ability to provide visual separation between aircraft and for aircraft to achieve visual spacing for the runway. This standard acceptance rate reduction applies to single and/or parallel runway operations where the runways are separated by 4,300 feet or more. Closely spaced parallel approaches is the term used to reference any approach involving aircraft that must operate closely together during the approach phase of flight where the runways are less that 4,300 feet apart. Special procedures are necessary for these approaches in instrument conditions. The implementation of Precision Runway Monitor (PRM) equipment and Simultaneous

Offset Instrument Approaches (SOIA) for closely spaced parallel operations will allow recapturing some of this capability. PRM requires runways to be separated by 3,400 feet for straight in and 3,000 feet for offset operations. SOIA refers to the procedures used when runway centerlines are less than 3,000 feet apart.

Special approach procedures apply the enhanced surveillance capabilities and offsets to allow continued arrivals at higher than otherwise permitted capacities on closely spaced parallel runways. These procedures will be published for NAS runways that are capable of supporting them. Procedures for all scheduled air carrier airports will be completed by 2006.

Capability will continue to increase as satellite navigation services become universally available over the United States airspace with upgrades to support instrument approaches. Complementary airport improvements in runways, markings, and airport lights are necessary to enable this increasing capability for approaches in poor visibility.

Instrument approach procedures will be published for most runway ends capable of supporting them. Procedures for Part 139 (scheduled air carrier) airports will be completed by 2006; procedures for public airports with runways less than 5000 feet will be completed by 2010. Capability begins with GPS-based Lateral Navigation (LNAV) non-precision approaches and continually increases as Lateral Navigation/Vertical Navigation (LNAV/VNAV) precision approach services become universally available over the US airspace in the mid-term. Service will be upgraded to be capable of Category I operations in the long-term using Local Area Augmentation System (LAAS) and then Wide Area Augmentation System (WAAS).

New approach procedures will increase in both availability and usage as widespread equipage and operations are enabled by the new navigation service. Further, the implementation of these procedures provides a new stabilized descent capability for numerous airports, supporting the CAST initiative seeking to reduce controlled flight into terrain incidents. Increased usage of GPS-based RNAV procedures will increase efficiency at many airspace-constrained airports.

The following sections address operational changes described:

- AW-1.1: *Continue arrival operations as weather deteriorates from VMC to IMC by increasing instrument approach services.*

- AW-1.2: *Continue arrival operations to closely spaced parallel runway as weather deteriorates from VMC to IMC through the implementation of new services.*

Benefits, Performance and Metrics

- Throughputs in arrivals per hour are sustained at a higher level as the ceiling and visibility decrease.

- Increased runway acceptance rate, in arrivals per hour, under IMC weather conditions.

AW-1.1 Continue arrival operations as weather deteriorates from VMC to IMC by increasing instrument approach services.

Definition and Requirements for Instrument Approach Services

Due to the complexity of the terms used in this paper, a set of definitions that provide a foundation for the discussion of the detailed operational changes are presented below.

- *Non-precision approach (NPA)* – Non-precision approach services support approach operations between 3 miles and 1 mile of visibility. Non-precision approaches are based on radio navigation for horizontal guidance; the vertical guidance is based on barometric altimetry. LNAV criteria define non-precision approach procedures for RNAV. Display within the cockpit varies by manufacturer of the airborne equipment, but generally can be thought of as similar to the localizer displays; i.e., with variance from course centerline displayed on the cockpit instrument as simple displacement of the indicator needle from its center point.
- *Approach with Vertical Guidance (APV)/Lateral Navigation/Vertical Navigation (LNAV/VNAV)* – FAA Order 8260.48 (RNAV Instrument Approach Procedures) was published in 1999 and includes a new minima line supporting instrument approaches with vertical guidance. Since its publication, ICAO has standardized the term APV to denote this capability. LNAV/VNAV is the actual minimum line that denotes the provision of vertical guidance to a decision altitude (DA) in lieu of a minimum descent altitude (MDA) associated with non-precision approaches.
- *Precision approach (PA)* – Below 1 mile visibility, increasing levels of precision approach operations require increasing levels of airport runway capability including airport runway lights, approach lights, runway visual range, and precision approach services.
- *Category I* – Category I operations support stabilized approach to as low as a 200' decision height, depending on obstacles and runway capability. Medium intensity runway lights (MIRL) and approach lighting systems reduce visibility minima to ½ mile. Touchdown zone RVR sensor and high intensity runway lights (HIRL) allows reduction in visibility minima to 1800 feet RVR. An airport capable of supporting scheduled air carrier service (part 139) requires appropriate runway construction, markings, and signage to support PA operations.
- *Category II* - Category II operations support stabilized approach to as low as a 100' decision height. A more accurate, higher continuity PA signal, high approach lights (ALSF-2) and rollout RVR sensor enable Category II operations.

- *Category III* – Category III operations support stabilized approach, landing and rollout operations all the way to touchdown. A more accurate, higher continuity signal and mid-point RVR sensor enable Category III operations.

Scope and Applicability

Near-Term

- *New RNAV Procedures.* A total of 129 new RNAV procedures have been designed for the FAA's 31 benchmark airports. Approaches for the 576 airports serving Part 139 operations are in development and will be completed by 2006.

- *New precision approach services.* Precision approach capability will be established, improved, or sustained at several runways with ILS, approach lighting systems, runway visual range, and Precision Approach Path Indicator (PAPI).

    - None of the FAA qualifiers for new ILSs will be established in the near term. Of the 15 facility mandates in 1999, 10 in 2000, and 28 in 2001, 14 of 53 will be commissioned.

    - Critical requirements for two ALSF-2 and four MALSR replacement projects are identified as near-term critical funding needs to avoid loss of approach services.

    - The requirement to sustain ground based navigation aids will be approved.

    - Previously identified safety needs for PAPI and distance measuring equipment will be analyzed.

Mid-Term:

- A number of ILSs and associated ancillary aids will be installed at selected runway to provide new precision approach capability. The remaining 39 congressionally mandated locations will be satisfied. New ILS qualifiers will be established, and ILS sustain equipment will replace deteriorating equipment, dependent on approval of validated funding requirements.

- WAAS will provide instrument approach services to LNAV/VNAV minima NAS-wide at locations where only non-precision approaches exist today. Most of the approaches at the Part 139 airports will be completed in the mid-term, with the balance completed by 2006.

- LAAS will provide precision approach services to Category I minima beginning in 2003.

- RNAV Instrument Approach Procedures: 780 public airports with runways over 5,000 feet long will receive RNAV procedures over the mid term extending into the long term, to be completed by 2010.

Long-Term:

- WAAS service planned for upgrade to Category I capability. A WAAS upgrade decision will be made in 2002. A decision on how far to reduce the existing ground-based infrastructure will be made in 2006. LAAS Category I approach procedures will continue to increase in 2004 and beyond. Of the 160 airports planned for LAAS services, 114 airports will support Category II or Category III operations, and the remaining 46 will support Category I procedures.

- Although approximately 1,100 NAS runway ends are quipped to support PA service, many of the approximately 3,000 NPA runway ends in the NAS require airport infrastructure upgrades to support PA services. Visibility minimums of 1 mile can be supported with visual runway markings and low intensity runway lights (LIRL) for nighttime operations. Medium intensity runway lights (MIRL) and precision or non-precision runway markings are required to reduce visibility minima to ¾ mile. To establish ½ mile-visibility minimums the additional equipment requirements are precision runway markings, MIRLs for nighttime operations, and an approved approach lighting system.

- For most paved public airports, GPS/WAAS precision approaches will support the publication of minima to one mile visibility without requiring significant airport improvements in marking, lighting, and signage; however, only Part 139 and public airports with 5000' runways will have instrument approach procedures by 2010. Procedures for the remaining 1,300 public airports with paved runways (with runways less than 5,000 feet) will be completed after 2010.

Key Decisions

- FAA and users will determine end-state services for WAAS and LAAS systems (technical feasibility and economic issues) before deployment, aircraft equipage, and ILS decommissioning begins.

    - Key decision points are 2002 to determine the WAAS upgrade path, and

    - 2006 to determine which ILS facilities will be decommissioned.

- Definition of WAAS and LAAS concept and procedures. The LAAS ConOps was completed in 2000. A SatNav Conops is still in draft. Neither have been signed out by the FAA. A review of the LAAS Conops needs to address changes in the Ground Based Augmentation Systems (GBAS) Performance Spec – Annex 10.

- Complete Advisory Circulars (AC) 120-29A, 20-RNP and 90-RNP. Completion of AC 120-29A, 20-RNP, and 90-RNP RNAV. AC 120-29A is a Category I/II AC. ACs 20-RNP and 90-RNP RNAV provide the certification and approval basis for RNP RNAV as defined by RTCA DO-236A/EUROCAE ED-75A. Criteria for RNP RNAV Standard Instrument Approach Procedures (SIAPs) are contained in draft Order 8260.RNP. All of these documents are currently "on-hold" and an expected publication date is now at least 18 to 24 months from the initial meeting of the Terminal Area Operational Aviation Rulemaking Committee scheduled for December 2001.

- Approval of Global Navigation Satellite System (GNSS) Standards and Recommended Practices by ICAO States. ICAO GNSS SARPs were introduced as part of Amendment 76 to Annex 10. Their effective date was November 1, 2001. Amendment 77 will contain revisions to SARPs, including GBAS Positioning Service and changes resulting from the newly published GPS Standard Positioning Service Performance Specification.

Key Risks

- Funding to develop, procure, install, and commission the above planned services.

- Geo-stationary satellite leases/acquisition risk for WAAS service.

- Timing and availability of WAAS/LAAS services.

- Voluntary user equipage and usage of WAAS/LAAS avionics/capability.

- Schedule for production version of WAAS/LAAS receiver.

- Planning for markings, signage, and lighting for precision approach runways.

- Environmental and airport infrastructure constraints.

AW-1.2 Continue arrival operations to closely spaced parallel runway as weather deteriorates from VMC to IMC through the implementation of new services.

Scope and Applicability

The intended benefits of PRM include increased throughput, reduced delays, and improved fuel savings. PRM was originally developed under Congressional mandate for five sites. There was no mandate for specific locations. Candidates were initially developed for airports using the 3,000 feet between runway centerlines standard. The FAA originally selected JFK, MSP, STL, ATL, and PHL as candidate airports. The Administrator agreed to reprogram the ATL PRM to SFO and a commitment was to accommodate ATL at the appropriate time.

Beyond the initial five sites for the PRM System, up to two other sites will receive PRM to support closely spaced runway operations in IMC and offer SOIA in deteriorating VMC.

Near-Term

- *National* SOIA standards will be developed with the user community. The final version of draft Order 8260.XX was forwarded to the SOIA Steering Committee hosted by Air Transport Association for comment. The SOIA order is currently being finalized by AFS. Associated air traffic document changes and flight standards handbook bulletins are being finalized.
- PRM at SFO and JFK

Mid-Term

- Further site-specific SOIA procedure development as new PRM sites are approved and utilized.
- PRM at ATL

Long-Term

- Further site-specific SOIA procedure development as new PRM sites are approved and utilized.

Key Decisions

- Finalization of PRM/SOIA procedures.
    - SOIA approach design criteria
    - PRM pilot training requirements

Key Risks

- Efficiency benefits may not be realized unless pilots and operators fully support and accept PRM-SOIA procedures.
- PRM-SOIA procedures are dependent on specific runway configuration. It may not be possible to conduct PRM-SOIA at every airport.
- Funding PRM Supportability Action Plan.